REMARKS

Review and reconsideration on the merits are requested.

The Prior Art Relied Upon

U.S. 5,629,067 Kotani et al (Kotani); JP 63-24731B (JP '731); U.S. Pub. 2004/0231307 A1 Wood et al (Wood); U.S. 7,008,461 B2 Kuki et al (Kuki).

Claim Amendments

As described in the specification at page 5, the present invention was achieved by the finding that "by forming a sintered ceramic honeycomb body by a material comprising cordierite as a main component, and by forming **plugs** by a plugging material containing ceramic particles and colloidal oxide, the **colloidal oxide** is converted to an amorphous oxide matrix even by low-temperature heating, thereby providing a ceramic honeycomb filter with a small difference in thermal expansion coefficient between the sintered ceramic honeycomb body and the plugs, and with a small residual stress because of the low-temperature bonding of the plugs" (see page 5, lines 2-9 of the specification; bolding added).

With respect to the **colloidal oxide,** the distinguishing features are that when the colloidal oxide in the plugging material is dewatered at a temperature of 1000°C or lower, a strong, solid, amorphous oxide matrix can be irreversibly formed, thereby strongly adhering the ceramic particles, and strongly bonding the plugging material to the partition walls of the sintered ceramic honeycomb body. Because the plugs contain the ceramic particles and the amorphous oxide matrix formed from the colloidal oxide, the plugs have a small thermal expansion coefficient, so that only a small difference in thermal expansion coefficients exists between the plugs and the sintered cordierite ceramic honeycomb body having a low thermal

expansion coefficient. Thus, the ceramic honeycomb filter of the present invention has a small residual stress (see page 10, lines 11-21 of the specification).

Accordingly, claim 1 is limited by incorporating the subject matter of claim 2 thereinto to make amended claim 1, on which claim 3 and 4 are dependent, respectively, claim 5 is limited by incorporating the subject matter of claim 7 thereinto to make amended claim 5, on which claim 6 and 8 are dependent, respectively, and claim 9 is limited by incorporating the subject matter of claim 2 thereinto to make amended claim 9. Claims 10 and 11 correspond to claims 4 and 8, respectively.

Applicants now address the claim rejections in the order posed.

The Examiner's position is set forth in the Action and will not be repeated here except as necessary to an understanding of Applicants' traversal which is now presented.

Rejection of claims 1-4 under 35 U.S.C. § 102(b) as being anticipated by Kotani.

It is noted that claim 2 is to be canceled from the pending claims, whereby this ground of the rejection is mooted.

Kotani discloses a ceramic honeycomb structure, which includes a ceramic honeycomb body having a matrix of partition walls forming a multiplicity of cells extending in an axial direction of the honeycomb body, where the radially outermost array of the cells is open to the outside of the honeycomb body in the radial directions thereof, to provide a plurality of grooves formed in an outer periphery of the honeycomb body extending in the axial direction (see Abstract of Kotani).

The Examiner states in Paragraph 2 of the Office Action that:

"Kotani et al. discloses a ceramic honeycomb filter (see col. 8 lines 48-52) comprising a sintered ceramic honeycomb body (14) having porous partition walls (4) defining flow paths, and

plugs formed in predetermined flow paths for removing particulate matter from an exhaust gas passing through the porous partition walls, the sintered ceramic honeycomb body being made of a cordierite; and at least part of the plugs (16) comprising ceramic (cordierite, see Tables 1, 2 and 4) particles and an amorphous oxide matrix formed from colloidal oxide (colloidal silica or colloidal alumina, see Tables 1, 2 and 4), wherein the ceramic particles are pulverized powder of the same material (cordierite) as the sintered ceramic honeycomb body in Figs. 1-5 and col. 4, line 66 to col. 14, line 67."

However, Kotani is silent about "plugs," rather teaching a ceramic honeycomb structure 18, in which a relatively large contact area is achieved between the **outer coating 16** and honeycomb body 14, since axial grooves 12 are formed in the outer periphery of the honeycomb body 14, whereby this effectively prevents or inhibits peeling-off of the outer coating 16 from the honeycomb body 14 (see col. 6 lines 48-52 and Fig. 4 of Kotani).

Specifically, on the ceramic honeycomb body 14 having axial grooves 12 on its outer periphery, the **outer coating 16** having a suitable thickness is formed such that at least the grooves 12 are filled with a reinforcing coating material which gives **the coating 16,** whereby the intended ceramic honeycomb structure is obtained which is reinforced at its outer periphery. A suitable coating material is thus applied to the outer peripheral portion of the honeycomb body 14 (as shown in Fig. 3), so as to fill at least the axial grooves 12 which are open to the outside, (as shown in Figs. 4 and 5), to thereby provide a ceramic honeycomb structure 18 having outer coating 16 as its outer wall (see col. 6, lines 31-42 of Kotani).

In contrast to Kotani, claim 1 of the present application calls for that: "A ceramic honeycomb filter comprising a sintered ceramic honeycomb body having porous partition walls defining flow paths, and plugs formed in predetermined flow paths for removing particulate

matter from an exhaust gas passing through said porous partition walls, said sintered ceramic honeycomb body being made of a cordierite-based ceramic material; and at least part of said plugs comprising ceramic particles and an amorphous oxide matrix formed from colloidal oxide, wherein said ceramic particles are cordierite particles and/or amorphous silica particles."

Major distinguishing features of the claimed invention reside in:

(1) a ceramic honeycomb filter comprising a sintered ceramic honeycomb body having porous partition walls defining flow paths, and plugs formed in predetermined flow paths for removing particulate matter from an exhaust gas passing through the porous partition walls,

(2) the sintered ceramic honeycomb body being made of a cordierite-based ceramic material; and at least part of the plugs comprising ceramic particles and an amorphous oxide matrix formed from colloidal oxide, wherein

(3) the ceramic particles are cordierite particles and/or amorphous silica particles.

Specifically, the "plugs" of the present invention such as plugs 12a, 12b are applied to the ceramic honeycomb filter 1 which is a sintered ceramic honeycomb body 11 comprising a peripheral wall 11a and porous partition walls 11b inside the peripheral wall 11a in such a manner such that plugs 12a, 12b alternately seal open ends of the flow paths 11c encircled by the porous partition walls 11b (see page 8, line 25-page 9, line 2 in paragraph [0034] of the specification). As a consequence, exhaust gas 10a containing particulate matter flows into the flow paths 11c through inlet-side open ends, passes through the porous partition walls 11b, and is discharged as a cleaned gas 10b from the exit-side open ends via the adjacent flow paths 11c. While passing through the porous partition walls 11b, the particulate matter contained in the exhaust gas 10a is captured in fine pores in the porous partition walls 11b. Thus, the ceramic

honeycomb filter 1 acts as an exhaust-gas-cleaning filter (see page 9, lines 10-16, full paragraph [0035] of the specification),

Further, ceramic particles used in the plugs are cordierite particles and/or amorphous silica particles, which are different from the cordierite particles of Kotani, which may be wholly or partially replaced by ceramic fibers formed of amorphous mullite or amorphous silica alumina, for example. The use of such ceramic fibers is advantageous in Kotani in avoiding cracks in the outer coating and effectively preventing peeling-off of the coating, the ceramic fibers having a fiber length of 10-15 μm and a fiber diameter of about 2-3 μm (see column 7, lines 45-51 of Kotani).

As discussed above, the features of claim 1 herein are completely different from the features disclosed in Kotani and, accordingly, claim 1 is not anticipated by Kotani.

Since claim 3 depends from claim 1, it is quite clear that claim 3 is also not anticipated by Kotani.

Since claim 4 is dependent directly or indirectly from claim 1, claim 4 is also not anticipated by Kotani.

Withdrawal is requested.

Rejection of claims 5 and 6 under 35 U.S.C. § 102(b) as being anticipated by JP '731

Claim 5 calls for that: "A method for producing a ceramic honeycomb filter comprising a sintered ceramic honeycomb body having porous partition walls defining flow paths, and plugs formed in predetermined flow paths for removing particulate matter from an exhaust gas passing through said porous partition walls, comprising the steps of forming said sintered ceramic honeycomb body by a cordierite-based ceramic material, and heating a plugging material filled in predetermined flow paths of said sintered ceramic honeycomb body to a temperature of

1000°C or lower to form plugs bonded to said sintered ceramic honeycomb body, wherein at least part of said plugs are formed by a plugging material containing ceramic particles and colloidal oxide.

Major distinguishing features of the invention of claim 5 reside in:

(1) a method for producing a ceramic honeycomb filter comprising a sintered ceramic honeycomb body having porous partition walls defining flow paths, and plugs formed in predetermined flow paths for removing particulate matter from an exhaust gas passing through the porous partition walls, the method comprising the steps of forming the sintered ceramic honeycomb body of a cordierite-based ceramic material, and heating a plugging material filled in predetermined flow paths of the sintered ceramic honeycomb body to a temperature of 1000°C or lower to form plugs bonded to the sintered ceramic honeycomb body, wherein

(2) at least part of the plugs are formed by a plugging material containing ceramic particles and colloidal oxide,

(3) whereby the sintered ceramic honeycomb filter of the present invention is provided with the advantages that: (a) because the plugs contain ceramic particles, there is a small difference in thermal expansion coefficients between the plugs and the sintered ceramic honeycomb body, and (b) because the plugs comprise an amorphous oxide matrix formed by a colloidal oxide, the plugging material is bonded to the sintered ceramic honeycomb body at low temperature, resulting in a low residual stress, so that the ceramic honeycomb filter of the present invention has excellent thermal shock resistance with a greatly reduced production cost (see page 19, lines 9-17 in full paragraph [0067] of the specification).

A particularly distinguishing feature of claim 5 is that (2) at least part of the plugs are formed by a plugging material containing ceramic particles and colloidal oxide.

In the discussion on JP '731 in paragraph [0010] of the present specification, it is emphasized that because the **cordierite honeycomb structure of JP '731 has a low thermal expansion coefficient** while the **plugs composed of mullite and alumina cement have a relatively large thermal expansion coefficient,** it is likely that **cracking occurs** between the ceramic honeycomb structure and the plugs upon being subjected to thermal shock by an exhaust gas, and the plugs would peel off, when in operation in an automobile.

Moreover, Example 1 of JP '731 teaches that after carrying out charging of the plugging material through the openings at both ends of the honeycomb structure, the resultant plugs formed in the flow paths of the ceramic honeycomb structure are maintained at a highest temperature of 1400°C for 2 hours for firing (sintering) (see English translation of page 4; right column (8), lines 27-37 (Example 1, lines 11-21) of JP '731 enclosed).

The features of JP '731 above are different from distinguishing features (1) to (3) of claim 5; accordingly, the amended claim 5 is not anticipated or obvious over JP '731.

With respect to claim 6, it is dependent from the amended claim 5, and accordingly, claim 6 is also not anticipated by JP '731.

Rejection of claim 9 under 35 U.S.C. § 102(b) as anticipated by Kotani

Claim 9 calls for: "A plugging material comprising ceramic particles and colloidal oxide, wherein said ceramic particles are cordierite particles and/or amorphous silica particles."

As earlier discussed, Kotani teaches cordierite particles, which may be wholly or partially replaced by ceramic fibers formed of, e.g., amorphous mullite or amorphous silica alumina quite different from the subject matter of claim 9.

Therefore, one skilled in the art referring to Kotani would not find claim 9 to be anticipated by Kotani.

Rejection of claim 9 under 35 U.S.C. § 102(e) as anticipated by Wood

The Examiner states in Paragraph 5 at page 4, lines 3-4, of the Office Action that: "Wood et al discloses a plugging material comprising ceramic particles (alumina and SiC) and colloidal oxide (colloidal alumina) in paragraph [0129]."

However, claim 9 calls for: "A plugging material comprising ceramic particles and colloidal oxide, wherein said ceramic particles are cordierite particles and/or amorphous silica particles," whose features are different from those disclosed in paragraph [0129] of Wood.

Accordingly, since there is no suggestion of the subject matter of claim 9 in Wood, quite clearly Wood does not anticipate claim 9 and withdrawal is requested.

Rejection of claims 7 and 9 under 35 U.S.C. § 103(a) as being unpatentable over JP '731 in view of Kotani et al

Claim 7 is canceled from the pending claims, whereby the rejection of claim 7 is mooted.

The Examiner states in Paragraph 7 at page 4, lines 3-5, of the Office Action that:

"JP 63-24731 B does not teach the plugging material comprising colloidal oxide, but Kotani et al. teaches a similar plugging material wherein the inorganic binder is colloidal silica or colloidal alumina in Figs. 1-5 and col. 4, line 66 to col. 14, line 67."

However, as earlier discussed, Kotani fails to disclose any teaching regarding the "plugs" for the present application; as a consequence, one of ordinary skill in the art would not find claim 9 to be obvious over JP '731 in view of Kotani and withdrawal is requested.

Rejection of claim 8 under 35 U.S.C. § 103(a) as being unpatentable over JP '731 in view of Kuki

Claim 8 (see also claim 11) calls for: "The method for producing a ceramic honeycomb filter according to claim 5, wherein said ceramic particles are pulverized powder of the same material as the sintered ceramic honeycomb body."

The Examiner states in Paragraph 8 at page 5, lines 3-7, of the Office Action that: "JP '731 does not teach the ceramic particles being pulverized powder of the same material as the sintered ceramic honeycomb body, but Kuki et al. teaches a forming plug material wherein the primary component is the same as the sintered ceramic honeycomb body so that the coefficients of thermal expansion coincide in col. 7, lines 5-12."

As should be clear from the earlier discussion regarding the rejection of claims 5 and 6 as anticipated by JP '731, claim 5 in no fashion is rendered obvious by JP '731. As claim 8 depends from claim 5, claim 8 therefore cannot be rendered obvious.

In more detail, although Example 1 of JP '731 discloses the use of a pulverized powder of cordierite **raw materials** as the plugging material in a cordierite honeycomb structure (see abridged English translation of Example 1 of JP '731 attached), JP '731 does not teach or suggest the use of a plugging material comprising ceramic particles and colloidal oxide forming the amorphous oxide matrix of the plug as disclosed in the present application (see paragraphs [0029] and [0030] of the present specification).

In this regard, the colloidal oxide is preferably 1-50 parts by mass per 100 parts by mass of the ceramic particles on a solid basis (see paragraph [0030] of the present specification). The inclusion of the colloidal oxide makes the bonding temperature of the plugging material as low as 1000°C or lower, making it unnecessary to conduct sintering at a high cordierite-forming temperature such as at 1400°C as the plugging materials used in JP '731 require (see abridged English translation of Example 1 of JP '731 attached).

Kuki teaches a method for manufacturing a honeycomb structure according to the first aspect of the invention; which comprises the step of injecting ceramic paste for forming the plugging portion at the end of the through channel, and subjecting either the ceramic paste thus injected or a plugging portion formed from the ceramic paste thus injected to processing to form a through-hole in the plugging portion (second aspect of the invention). In this case, it is preferable to form the through-hole with a diameter of 0.2 mm or more, but not more than a value which is smaller between 1 mm and 75% of a diameter of an inscribed circle of the through channel (see the Abstract of Kuki).

Specifically, Kuki teaches that a plugging portion is formed from the same material as that of the honeycomb structure is preferably used, because the coefficients of thermal expansion thereof will coincide with each other. Kuki thus discloses as materials of the honeycomb structure, from the viewpoint of strength or heat resistance, one having a major crystal phase selected from the group consisting of cordierite, silicon carbide, silicon nitride, alumina, mullite, and lithium aluminum silicate (LAS) (see column 7, lines 5-12 of Kuki) is preferable.

Moreover, the Kuki honeycomb structure has as a characteristic structure that a **through-hole 13** formed in at least a part of the plugging portion 11, whereas the diameter of the through-hole 13 is 0.2 mm or more, but not more than a value which is smaller between 1 mm and 75% of a diameter of an inscribed circle of the through channel 9 (see column 5, lines 1-6, and Fig. 1 of Kuki). Such features are completely different from those of the plugs claimed in claim 5 of the present application.

Accordingly, one of ordinary skill in the art referring to JP '731 would not have found distinguishing features (1) to (3) of claim 5 to be obvious, even if JP '731 were to be combined with Kuki.

Since claim 8 depends from claim 5, claim 8 is also not obvious over Kuki.

Rejection of claims 1 and 4 under 35 U.S.C. § 103(a) as being unpatentable over Wood in view of JP '731

The Examiner states in Paragraph 9 at page 5, lines 9-11, of the Office Action that:

"Wood et al. does not teach the sintered ceramic honeycomb body being made of cordierite, but JP 63-24731 B teaches cordierite being a well known ceramic material for forming sintered ceramic honeycombs."

As earlier discussed in detail, JP '731 does not teach the ceramic particles being pulverized powder of the same material as the sintered ceramic honeycomb body.

As a consequence, JP '731 does not remedy the defects of Wood, and the combination of references cannot render claims 1 and 4 obvious.

It is to be noted that a particularly distinguishing feature of claim 1 resides in the ceramic particles being cordierite particles and/or amorphous silica particles.

However, the plugs of JP '731 are composed of mullite and alumina cement having a relatively large thermal expansion coefficient, and JP '731 then fails to teach or suggest any plugging material containing ceramic particles and colloidal oxide. Accordingly, claim 1 is not obvious over JP '731 for the same reasons that claim 5 is not obvious as earlier discussed with respect to the rejection of claim 5 as anticipated by JP '731.

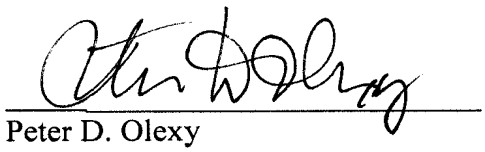
Accordingly, claim 1 is not obvious over Wood in view of JP '731.

Since claim 4 depends from claim 1, claim 4 is not obvious for the same reasons as

advanced with respect to claim 1.

Withdrawal of all rejections and allowance is requested.

Respectfully submitted,



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